BULLETIN No. 5

COMMONWEALTH OF PENNSYLVANIA
BOARD OF FISH COMMISSIONERS

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# METHOD OF CARING FOR GOLDFISH IN THE PENNSYLVANIA STATE HATCHERY AQUARIUMS

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HARRISBURG, PENNSYLVANIA
1928

Commonwealth of Pennsylvania

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# METHOD OF CARING FOR GOLDFISH, IN THE PENNSYLVANIA STATE HATCHERY AQUARIUMS

By C. R. BULLER, *Deputy Commissioner of Fisheries*

In the Pennsylvania State Hatcheries that maintain aquariums, many species of fresh water fish are on display. Among these collections can usually be found such varieties of goldfish, as the Comet, the Shubunkin, the Japanese Fringetail, the Telescope and the common goldfish. In addition to these various types of goldfish used for display purposes, they have on hand a supply of common goldfish for distribution to our public schools, hospitals, scout head-quarters, etc. These can be obtained by making application to the Board of Fish Commissioners, Harrisburg, Pa., with the understanding that the applicant will bear the express charges on the consignment.

The following paragraphs, explaining the method of caring for the goldfish in the hatchery aquariums, are written with the thought that they may be of assistance to those obtaining fish from this source, and are not intended as a treatise for those who contemplate entering into the rearing and propagating of goldfish. A number of good books on aquarium fishes are published and those interested would do well to obtain copies from sellers, as they contain much useful information and have many illustrations.

## TYPE OF AQUARIUM PREFERRED FOR THE GOLDFISH

Of the many types of aquariums manufactured, the straight sided ones, with the frame made either of angle iron, nickle, or aluminum, to which is bolted a slate bottom, with glass back puttied in the sides and ends, are preferred because the fish and plants are displayed to a good advantage in them and they are easily cleaned, can be repaired when broken, and generally expose more water surface to the air.

For reasons of economy the Board generally designs and makes its own aquariums and display tanks. Those used for goldfish display are rarely provided with running water, which follows that the fish must depend on some other means for the exchange of gases in the water that is necessary for all fish life. This exchange can take place in either or both of the following ways: By the use of aquarium plants and through the surface water directly exposed to the air.

In order to understand the exchange of gases necessary for the wellbeing of the fish, it must be remembered that fish breathe, as do land animals, but in their respiration, the water is drawn in over the gills, where in the purification of the blood, oxygen is exchanged for poisonous gases, principally carbon dioxide. Thus it can be seen

that if this same exchange of gases were not taking place in the water the fish would soon suffocate. Certain aquarium plants utilize in their growth the carbon dioxide thrown off by the fish and in turn liberate oxygen. Thus it can be seen that if the proper ratio, between plant and animal life is established, the exchange of gases would take place within the aquarium and no other means of exchange would be necessary. This would be what is termed a balanced aquarium.

The great difficulty in establishing the balanced aquarium is that plants can not be depended upon to grow and function properly, without long periods of rest, during which they make very little, if any, exchange of gases.

For this reason we depend entirely for this exchange to take place at the surface. It follows that the ability of an aquarium to support fish over a given period will be directly proportionate to the number of square inches of water surface directly exposed to the air. Therefore, in selecting aquariums, much consideration is given to the number of square inches of exposed water surface.

## SETTING UP THE AQUARIUM

In the goldfish aquariums, we have sand, aquarium plants, water, goldfish and scavengers.

Sand—Any good grade of building sand, after it has been thoroughly washed to prevent roiling the water, is placed to the depth of about three inches on the aquarium bottom. An exact amount of sand is probably of little importance, except we have found it requires about this depth to thoroughly anchor the aquarium plants.

Sand is used in preference to a coarser material such as gravel, because it makes a better anchorage for the plants. Uneaten food, dead plant life, and foreign matter are more easily removed because they are less liable to escape the notice of the attendant, by being hidden from view among coarse material, and the siphon hose with which the foreign matter is removed, is less apt to become clogged. Scavengers, principally the snail and mussel, are more at home on fine material.

Aquarium Plants—In a previous part of this bulletin I dwelt to some length, upon the exchange of gases taken with the water as a medium, between growing plants and fish, and how through a proper ratio between the two, the so-called balanced aquarium is established. Hatchery aquariums are set up with the thought that they will contain fish the year around, and calculations are based on the greatest disadvantages likely to be encountered over this period. Most plant life, whether terrestrial or aquatic, has daily and seasonal resting periods. Animal respiration goes on continuously during life, with

the result that if plants are relied upon for oxygenating the water during these periods, the animal life is going to be in want of air. So for this reason, plants in hatchery aquariums are not looked upon as aerating agents, but simply used, where conditions permit, as a better background for displaying the fish.

Proper light is a great governing factor in the growth of aquatic plants. Where this can not be obtained, no plant life is introduced, for the reason that dead and decaying plant life throws off gases detrimental to fish in aquariums, making them more harmful than beneficial.

In aquariums that are ideally situated for their growth, the following plants, which can be generally purchased from goldfish dealers or pet stores are used. Cabomba Caroliniana and Cabomba Roseafolia, which is found very decorative when first introduced, but because of its brittleness, is soon destroyed by the fish.

Myriophyllum is very decorative because of its fine, hair-like leaves, and is quite hardy. Sagittaria Natans is found very good because it multiplies rapidly, grows under rather adverse conditions, and is said to function the year round. Duckweed is one of the small floating plants found on many ponds from mid-summer until late fall, and when obtainable, is placed in the aquarium as food for the larger fish.

Water Hyacinth, in my judgement, is one of the most decorative of the floating plants. The dark, finely divided roots, make a wonderful background for the display of the goldfish.

In planting after the sand is placed in the container, water is added to the depth of several inches. The plants to be rooted are then embedded in the sand, to a depth sufficient to keep them from unrooting. Care should be taken during planting, to see that all plants are kept well moistened. The plantings are made quite dense, but not to such an extent that it would interfere with the movement of the fish. The aquariums are then filled to the desired level with water, care being taken, not to unroot the plants during the filling.

Water—Without question, more fish can be kept in an aquarium equipped with running water, than in the so-called still water type. The object, in maintaing goldfish in hatchery display rooms, is for the purpose of exhibiting the various types to the best advantage, and not to see how many fish can be kept in a given area.

For a number of reasons the still water type is used in hatcheries. First, the spring water supply maintains an even temperature throughout the year, of about 46° F. If permitted to circulate continually through the aquariums, the temperature would be too low for the well-being of the goldfish, as well as for the aquatic plants. Second, the warm air of the room coming in contact with the cold glass of the container, will cause a collection of moisture on the outside surface, making it difficult to see the inhabitants within. Third,

the well-being of most aquatic plants requires certain gases thrown off by the fish through their respiration. In a circulating water system these gases do not collect in a sufficient quantity for the need of the plants. Fourth, the springs are not entirely free from surface water during rain storms, and the melting of the snow. Hence, during these periods, roily water will enter the containers, making frequent cleanings necessary. By the use of the still water type, all these objectionable features are overcome.

**Fish**—The number of fish that can live in an aquarium, over a given period, depends upon so many things, such as temperature, light, ventilation, water surface exposed, kind of food used, etc., that no fixed rule can be applied. But in stocking the hatchery aquariums, after taking into consideration the greatest disadvantages likely to be encountered, and that a few good healthy specimens will make a better display and require less care than a greater number living in an overcrowded condition, it was found that a safe rule to follow, is to allow 24 sq. inches of water surface to every inch of body length of the fish, That is to say, an aquarium 18 inches long, and 18 inches wide, would have a water surface of 324 sq. inches. Since one inch of fish body requires 24 sq. inches, 324 sq. inches would support as many one-inch fish, as 24 is contained in 324, or approximately 13. Suppose 4 inch fish were to be introduced. If one inch of fish requires 24 sq. inches, four inches would require four times 24, or 96 sq. inches. Therefore, 324 sq. inches would support as many 4 inch fish as 96 is contained in 324, or approxiately 3.

**Scavengers**—Another very useful inhabitant of the aquarium, is the scavenger or house cleaner. This is an animal that will feed upon fish refuse, uneaten particles of food, etc., and still not greatly interfere with the fish. We use various kinds of aquatic snails, fresh water mussels, and frog tadpoles. Tadpoles will live in any waters where goldfish will thrive, but this is not the case with the snails or mussels. Certain waters do not contain minerals necessary for their shell-like covering with the result that they soon die. Because of their shell-like covering, and their habit of remaining almost motionless for long periods, makes it difficult to distinguish the living from the dead, resulting in the frequent loss of the fish, due to foul water, caused by their decay.

## LOCATING THE AQUARIUMS

In the display rooms, hatchery experiments show that temperature, light, and ventilation have a great influence on the aquarium inhabitants, and must be given consideration.

**Temperature**—Fortunately, goldfish can stand a wide range of temperature, if the change is gradual, but sudden changes are very injurious and many times prove fatal. Throughout the year, the

hatchery aquarium temperatures range from 50° F, to 80° F. without any apparent discomfort to the fish. However, in allotting the number of fish to the aquarium, the highest temperature likely to be encountered is considered one of the disadvantages to be met, because the ability of water to retain oxygen is lessened with a rise in temperature. Being cold-blooded animals, the body activities of fish are increased with the rise of temperature, causing them to consume more oxygen at a time when the ability of the water for retaining it is greatly lessened.

Certain aquarium plants, when the water temperature is high, and light conditions favorable, are wonderful oxygenators. If these are present, they often times help to offset the above conditions, due to the adverse temperatures of warm weather.

**Light**—As mentioned elsewhere, when plants are used, a certain amount of sunlight is very necessary. To just what extent it is beneficial to fish life, I am not prepared to definitely say, but from observation I am lead to believe that it is of as much importance to the well-being of most aquatic life, as it is to the animals living on land, and where conditions permit in hatcheries the containers receive several hours of sunlight each day. An excessive amount is not desirable, for the reason that in small containers, the direct rays, shining through the glass, will raise the water temperatures too sudden. Again, in aquariums of all sizes, an overlong exposure will have a tendency to form Algae quickly, causing the water to turn green. This so-called green water is considered beneficial to the fish, but is not very pleasing to the eye and its growth is retarded as much as possible.

**Ventilation**—The ventilation in the hatchery buildings plays an important part in the aquarium management, as we depend for the exchange of gases to take place at the water surface. If the building is poorly ventilated, this action is greatly retarded. Again, water absorbs injurious gases, as well as beneficial ones. Among these are coal gas, paint fumes, tobacco smoke, and others. Proper ventilation helps to lessen the danger from these sources.

**Feeding**—In nature, fish live on a great variety of foods. It has also been found that aquarium fish thrive better if their diet is changed from time to time. Once each day feedings are made of one of the following foods: chopped earthworms, finely chopped sheep hearts, whole wheat bread, oatmeal, and certain small crustaceous organisms that are artificially propagated for feeding certain species of fish. In running tests of the merits of the various prepared goldfish foods, sold on the market, a number of good ones have been found, and in most instances the dark, grandular form are preferred to the flakes or wafers. No fixed rule for the amount of food to be fed can be applied. The attendants are cautioned to bear in mind that fish are cold-blooded animals and when the water temperatures

are low the body activities are slowed down and require less food. In spite of this, more fish die from overfeeding than from any other cause. I do not mean to imply that the fish over eat, but uneaten particles of food soon foul the water and if remedial measures are not quickly taken the result will be disastrous.

## CLEANING THE AQUARIUM

The worse difficulty in maintaining attractive aquariums is to keep down the green, moss-like growth that collects principally on the sides of the glass, and is known as Algae. The rapidity of the growth of Algae will depend a great deal upon the sun exposure. Algae requires a certain amount of sunlight, in order to thrive. Because of its unsightliness, the aquarium glasses are cleaned, once each week, by carefully wiping them with a sponge. Starting at the bottom and wiping upwards. After each stroke the sponge is thoroughly rinsed in a separate container. If this is done each week, the Algae is removed from the glass without greatly disturbing the aquarium contents, but if the Algae is permitted to remain for some time it is more difficult to remove. Experiments show that it can be taken off quite satisfactorily with a safety razor blade. The principal objection of this method is, that the Algae will escape in the aquarium water, thus giving it a more or less roily appearance.

Two or three times a year the aquariums are given a complete change of water and thoroughly washed. When this is being done if the sand is sweet and clean, it and the aquarium plants will not be disturbed. But in some instances (probably due to the decay of vegetable matter in the sand), it takes on a dark appearance and throws off a foul odor. In these cases the plants are first removed, care being taken to keep them always moist, and the sand thoroughly washed or replaced with a new supply.

To avoid sudden temperature changes when cleaning and changing the water, the fresh supply is brought into the building the previous night in thoroughly clean containers. This gives the new water a chance to reach the same temperature as the old before fish are introduced. Goldfish breeders and aquarists tell us that if aquariums are propertly managed complete water changes will rarely have to be made, that is, possibly not more than once or twice a year. The hatchery management has been unable to set a definite period for the complete water change for the reason that frequently an aquarium will take on a milky or cloudy appearance, and the fish will be seen grasping at the surface. This condition is generally brought about by the decomposition of some foreign substance, such as uneaten particles of food caused by overfeeding, dead snails, or mussels, decaying plant life, etc. When this condition is detected the container is at once thoroughly cleaned and refilled with fresh water.